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ABSTRACT

A study was conducted to collect information on the origins of reading and learning disabilities and on the characteristics of learning disabled children. Data were collected from case histories and evaluation and follow-up reports for 372 learning disabled subjects, aged 6 to 22 years. Characteristics of the subjects were similar to those of dyslexic, hyperkinetic, minimally brain damaged, and perceptually handicapped children. The evidence collected indicated the following conclusions: (1) the general origin of reading disabilities appears to be parental blood incompatibilities complicated by various prenatal difficulties; (2) the effect of these problems is neurological disorganization, which caused 80% of the subjects to have losses of a year or more in reading and spelling levels; (3) 98% of the children had average or better intelligence; (4) school retention causes further losses in reading achievement; (5) gains made from remedial programs are retained; and (6) it is hard to determine the effect of neurological disorganization on reading achievement because poor teaching and the frustration of failure can also depress reading achievement. (Extensive appendixes contain materials used in the study.) (HTH)

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THE RELATIONSHIP OF INTELLIGENCE, VISUAL PROBLEMS AND NEUROLOGICAL ORGANIZATION TO READING - LEARNING DISABILITIES

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CHAPTER I

INTRODUCTION

A. PURPOSE OF STUDY

The MSCW Reading Center was opened in the fall of 1966. Since that time, children from all sections of Mississippi have been evaluated to determine the type of remedial program that would help them overcome their reading-learning disability. The purpose of this research, therefore, was to collect information that would answer the following questions:

1. What were the etiologies of the reading-learning disabilities?

2. What were the characteristics of Mississippi children with reading-learning disabilities?

3. What remedial programs were prescribed?

4. How effective were the remedial programs?

B. SAMPLE USED

A check of the folders on file indicated that 424 children had received complete evaluations, and another 101 had been given partial evaluations as of June, 1972. Out of the 424 complete evaluations, 260 cases were from the Columbus area; 164 cases were from other sections of the state of Mississippi. Four hundred (400) of the children were from middle to high income, Caucasian families; twenty-four (24) were from low income families.

Two hundred two (202) of the Columbus area children received in-clinic remedial services at the MSCW Reading Center. Home programs were prescribed for the 164 children from elsewhere, but only 59 made use of our re-evaluation services. Seventeen children were not accepted for remediation services since their evaluations indicated no difficulty with reading.

Only 389 cases had complete enough case history data to be useable for getting needed information. Table I indicates

TABLE I
AGES OF CHILDREN EVALUATED
AT MSCW READING CENTER (1966-1972)

Age (yrs.-mos.)	No.	Age (yrs.-mos.)	No.
4-11 to 5-4	3	11-0 to 11-11	44
6-0 to 6-11	23	12-0 to 12-11	26
7-0 to 7-11	50	13-0 to 13-11	19
8-0 to 8-11	74	14-0 to 14-11	7
9-0 to 9-11	67	15-0 to 22-6	28
10-0 to 10-11	48	TOTAL	389

the ages of the 389 subjects. The median age was 9 years 5 months; the range was from 4 years 11 months to twenty-two years six months.

Out of the 389 cases, 80 (23%) were female, and 309 (77%) were male. The 8 to 2 ratio has been reported several times in the literature as being characteristic of reading clinic populations. One hundred ninety-three (193) or 51 per cent of the cases had been retained one or more years in school, and most had received some tutoring or summer school instruction prior to being evaluated.

C. METHODS FOR COLLECTING DATA

The MSCW Reading Center policies require that parents contact the center to ask for evaluation services. Exceptions are made when the teacher or family doctor makes the request as agents of the parents. Before the evaluation appointment is made, a case history form, a form for the family doctor, and a form for the school must be completed and returned. (See Appendices A, B, C) These forms become part of the child's permanent folder kept on file in the clinic.

During the evaluation, the following tests are administered to try to determine the causes of the disability as well as the level of reading performance demonstrated by the child:

1. Keystone Telebinocular Survey
2. Speech and Hearing Screening (done by MSCW Speech and Hearing Clinic)
3. Neurological Organization Test
4. Slingerland Specific Language Disability Test
5. Wepman Auditory Discrimination Test
6. Slosson Drawing Coordination Test
7. Slosson I.Q. Test
8. A battery of word recognition, oral reading, and silent reading tests
9. Hearing Capacity Test
10. Phonic Analysis Inventory (IEA)
11. Informal Spelling Inventory

After the evaluation, a diagnostic summary is completed and sent to the parents and the school. A copy of the summary is kept in the permanent file of the child.

In addition to the case history and evaluation information, a questionnaire (See Appendix D) was sent to 300 parents of children who had been evaluated and placed in remedial programs either at the clinic or at home. The questionnaire sought to obtain information on present school and reading performance.

II ETIOLOGIES OF READING DISABILITIES IN CHILDREN EVALUATED AT MSCW READING CENTER (1966-1972)

Information about the source of a reading disability does not contribute directly to the educational program needed to help overcome the disability. However, such information could and should be helpful to both physicians and teachers who try to provide help for children with reading disabilities.

The case history forms (See Appendix B) that parents fill out prior to having their child evaluated were set up to secure information relating to:

1. Family histories of reading disabilities
2. Blood types of parents and child
3. Pre-natal factors thought to be related to central nervous system dysfunctions
4. Peri-natal (labor and delivery) factors known to be related to nervous system disorders
5. Post-natal health histories
6. Post-natal mobility and language development histories

Case history data, of course, is always subject to question, but follow up evaluation interviews were made. The interviews often produced additional information not included on the case history. It is assumed that parents were being honest.

A. GENETIC INVOLVEMENT:

Only about 58 of the 389 appeared to have the possibility of the reading disorder being genetic in origin. Twenty-five (25) mothers and 32 fathers reported they, too, had had difficulty with reading. In 81 cases other brothers or sisters were having difficulty with reading also.

Since reading is a learned ability, the question naturally arises as to how the disorder is inherited. The only tenable hypothesis would be that the central nervous system dysfunction that led to the reading disorder was passed on to the child through the genes. One child's father had been found to have a brain tumor after his sudden passing. Case history data indicated that two infants in the family had been stillborn and another brother had difficulty with reading. Can brain damage affect the genetic structures of an individual?

B. PRE-NATAL AND PERI-NATAL CONDITIONS RELATED TO READING DISABILITIES:

Another line of research has sought to establish the source of reading disabilities as damage done to the central nervous system from various pre-natal, peri-natal or post-natal conditions. Thus the reading disability is acquired rather than genetic in origin. The aforestated viewpoint is the personal bias of the investigator.

Various researchers have shown that various noxious influences, viral attacks such as rubella, blood incompatibilities, endocrine disturbances in the mother, drugs, poor health, anoxia and difficult birth processes can affect foetal development and produce brain damage and physical defects.

Further support of the above findings was obtained from the case histories of 389 children evaluated at the MSCW Reading Center. Only 71 of the 389 case histories indicated no pre-natal or peri-natal difficulties.

Table II shows the summary of blood type information secured.

TABLE II

BLOOD TYPES OF PARENTS
OF CHILDREN EVALUATED AT
MSCW READING CENTER (1966-1972)

	PARENTAL BLOOD TYPES		NO.	%
1.	RH^-	RH^+	99	37
2.	AB	O	30	13
3.	O^+	O^+	45	20
4.	A^+	O^+	27	12
5.	A^+	A^+	20	10
6.	B^+	O^+	15	7
7.	A^+	B^+	3	1
		Total	239	
8.	unknown		150	
		N =	389	

As can be seen in Table II, 37% of the cases involved an RH incompatibility. Although the sample involves children living in Mississippi at the time, about 100 of the cases were children of Air Base personnel born elsewhere in the United States.

TABLE III

PRE-NATAL DIFFICULTIES REPORTED
MOTHERS OF CHILDREN EVALUATED AT
MSCW READING CENTER (1966-1972)
(N = 389)

	TYPE OF DIFFICULTY	NO.	%
1.	Drugs taken for nausea	94	24
2.	Anemic During Pregnancy	94	24
3.	Anemic Between Pregnancies	17	4
4.	Toxemia	4	1
6.	Frequent hemorrhaging	10	3
7.	Durgs for allergies or fluid	57	15
8.	Flu vaccine taken	23	5
11.	Placenta separation	4	1
12.	Thyroid difficulties	5	1
13.	Diabetic condition	2	.5
14.	Exposure to German measles	14	4
15.	Viral infections	14	4
16.	Kidney inflammation or infections	7	2
17.	Difficulty carrying child to term	20	5
18.	Drugs taken for illness	21	5
19.	Very poor health	15	4
20.	Unknown	19	

TABLE IV

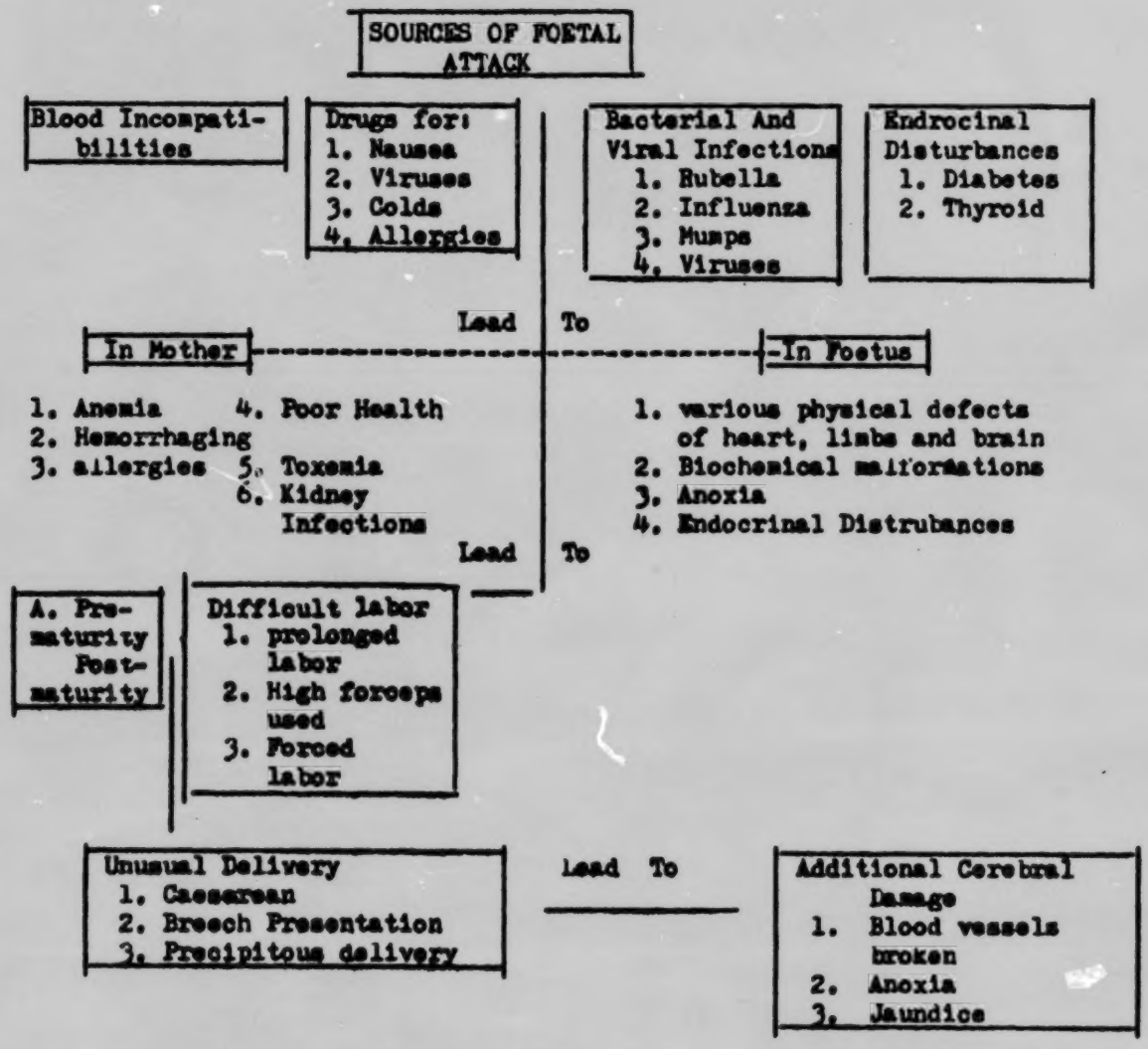
PERI-NATAL DIFFICULTIES REPORTED
BY PARENTS OF CHILDREN EVALUATED
AT MSCW READING CENTER (1966-1972)

	TYPE OF DIFFICULTY	NO.	%
1.	Prolonged labor (exceeding 24 hrs.)	59	15
2.	Premature	38	10
3.	Breech presentation	17	.4
4.	Caesarean	20	5
5.	Forced labor	16	4
6.	High forceps used	41	10
7.	Anoxia	21	4
8.	Cord wrapped around neck	5	1
9.	Precipitous birth	29	8
10.	Twin birth	8	2
11.	Child discolored at birth	24	6
12.	Postmature	4	1
13.	Labor delayed by doctor	1	0

One should be able to expect that at least one-third of reading disability cases could be the consequence of parental RH incompatibilities. Evidence is also available that shows that any two blood types in the ABO group can be incompatible if the child inherits a paternal antigen which the mother's blood does not possess. Obviously, further medical research is needed to confirm my hypothesis.

Tables III and IV present additional pre-natal and perinatal difficulties that mothers reported. From the tables, the investigator put together the chart on the following page to demonstrate the possible relationships.

Figure 2 Relationships Among Pre-Natal and Peri-Natal Difficulties



It would then be possible for any one or of combination four pre-natal conditions to be the source of the central nervous system damage that leads to reading disabilities: 1) blood incompatibilities 2) drugs taken 3) bacterial and viral infections and 4) endocrinal disturbances in the mother.

A check on the RH incompatible and AB-O incompatible cases showed that 89 (62%) of the 129 cases followed the sequence outlined in the chart. Prematurity, caeserean deliveries, breech presentations, and prolonged labors were frequent occurences in these 89 cases.

C. POST-NATAL DIFFICULTIES

Table V shows various post-natal difficulties that were found in the 389 cases. They have been grouped according to various difficulties that other researchers have reported: 1) blood difficulties, 2) cerebral damage, 3) allergies, 4) irritability, 5) hyperactivity, 6) physical anomalies, 7) high susceptibility to upper respiratory infections, 8) unusual motor development, and unusual speech-language development.

Most of the 389 children had multiple difficulties. The two difficulties that involved the highest percentage of children were allergies, 175 or 53 per cent; and hyperactivity, 119 or 31 per cent. Although head banging and head injuries were not included in the 119 total for hyperactivity, the researcher felt that they were the results of hyperactive behavior.

A check was made on the 16 children who had been diagnosed as being brain-damaged to see if there were other accompanying difficulties. There was an accompanying cluster of : HYPERACTIVITY - UNUSUAL SPEECH-LANGUAGE DEVELOPMENT - UNUSUAL MOTOR DEVELOPMENT. It can be assumed, therefore, that this cluster is the result of central nervous system dysfunction just as reading disability is.

TABLE V

POST-NATAL DIFFICULTIES OF CHILDREN EVALUATED AT MSCW READING CENTER (1966-1972)
(N = 389)

		NO.
I	Blood Difficulties	
	A. Blood exchange required	6
	B. RH Jaundice	2
	C. Anemic	37
	D. Teeth discolored	2
	E. Frequently fatiqued	42
	F. Vitamin K Deficiency	4
II	Cerebral Damage:	
	A. Brain damage diagnosed by physician	16
	B. Convulsions	20
III	Allergies	175
IV	Irritability	
	A. Early feeding problems	64
	B. Colicy	73
V	Hyperactivity	119
	A. Banged head as infant	17
	B. Head Injuries	63
	C. Spastic Stomach	7
VI	Physical Anomalies	No.
	A. Open-heart surgery	4
	B. Hernia operation	14
	C. Eye-surgery	13
	D. Polyps	6
	E. Bone tumors	6
	F. Toe Deformed	3
VII	Susceptibility to Upper Respiratory Infections	
	A. Tonsillectomy - Adenoid Removal	87
	B. Pneumonia prior to age 1	20
	C. Pneumonia after age 1	23

TABLE V (continued)

		NO.
VIII	Unusual Motor development	
	A. Abnormal mobility	64
	B. Slow in sitting up	22
	C. Mixed Handedness	17
IX	Unusual Speech-Language Development	
	A. Stutters	55
	B. Articulation defect	52

Other post-natal complications not reported in Table V could have contributed additional damage to the cortex. Listed below are the complications and the frequency with which they occurred:

	COMPLICATION	NO.
1.	Scarlet Fever	9
2.	High Fevers	75
3.	Spinal Meningitis	4
4.	Toxic Drug Poisoning	5
5.	Thyroid deficiency	1

Figure 2. Other Post Natal Complications

SUMMARY

In summary, children with reading disabilities from Caucasian, middle to high income families, could be expected, a great deal of the time, to have suffered some pre-natal or peri-natal difficulties. Accompanying the reading disability may be a history of allergies, speech-language defects, and hyperactivity.

D. RESEARCH RELATED TO ETIOLOGIES OF READING DISABILITIES

One of the most comprehensive studies of the relationships between intrauterine attacks on the foetus and the development of reading disabilities was done by Kawai and Pasamanick (4) in 1959. In their summary of research that included their own, they found the following pre-natal and peri-natal conditions to be related to reading disabilities:

1. anoxia (oxygen loss)
2. prematurity
3. caeserean birth
4. breech presentations
5. maternal rubella
6. maternal bleedings
7. RH incompatibilities
8. Toxemias of pregnancy.

Their studies led them to the following conclusions:

1. "Our hypothesis that there exists an association between maternal and fetal factors and the development of reading disabilities was made after encountering many studies and clinical observations that incriminated cerebral injury consequent to complications of pregnancy, delivery, and the neonatal periods as a causative factor in many disorders of reading"

2. "Low intelligence is not a predominant cause in severely retarded readers."

Since the 1959 summary by Kawai and Pasamanick, the confirmation of maternal rubella and drugs as causes of birth defects has been accepted. The other pre-natal and peri-natal factors listed above are still under investigation.

1. Psychiatrist F. W. Black (5) compared the birth histories and EEG's of three groups of readers: 1) 30 normal readers, 2) 30 retarded readers with low visual perception abilities, and 3) 30 retarded readers with adequate visual perception abilities. His conclusions were as follows:

1. "There appears considerable support for the proposal that children of normal I. Q. and significant reading retardation are more neurologically pathological than are normal readers."
2. "The increased incidence of EEG and birth abnormalities in retarded readers with visual perception deficits suggests the possibility of an organic etiology."

B. N. Klosovskii in his book, The Development of the Brain and Its Distrubance by Harmful Factors, provides extensive research

results relating to the harmful effect on neurological development of Russian children from such noxious factors as: 1) anoxia (lack of oxygen) or asphyxia , 2) prematurity, 3) disturbances of the maternal endrocrine system such as thyroid disturbances and diabetes, 4) quinine, 5) influenza, and 6) X-rays.

He suggests that certain portions of premature children's brains are underdeveloped due to the premature drop in the protein levels in the brain. No actual details of the brain damage done by asphyxia of the foetus are given. However, he has given a description of the 71 of 100 children who showed behavioral symptoms much like those being described in the current literature on dyslexia and learning disabilities. He says the parents complained of the children's:

1. excessive restlessness
2. excitability
3. fussiness
4. fatiguability
5. touchiness
6. propensity to tears
7. disturbed sleep with sudden movements and talking

Thirty of the 100 children had definite neurological abnormalities although mild in character.

Weiner, et. al.(7, 8, 9) in 3 studies from 1965-1969, have investigated the relationship of prematurity to reading and arithmetic achievement. They found a positive relationship between prematurity and lowered school achievement. Eaves, et. al. (10) in a 1970 study reached the same conclusion as Weiner.

Two other centers that have evaluated and treated children with reading disorders have reported similar factors in the pre-natal and peri-natal histories. Dr. Carl Delacato (3) and Dr. Charles Shedd (11) both have reported findings similar to those summarized by Kawai and Pasamanick. Shedd evaluated 250 children from Indiana, Alabama and Georgia; he divided them into two groups which he named dyslexics and hyperkinetics. In both groups, premature births, difficult labors, caeserean deliveries, and breech presentations were reported by the children's mothers. He noted also the higher incidence of hyperkinesis associated with caeserean deliveries.

Other researchers are investigating the relationships of blood incompatibilities to central nervous system dysfunctions. Hyman (12) in 1969 suggested that there was a relationship. Gartner (13) in 1970 found that premature infants that died within 6 days after birth showed evidence of kernicterus - diagnosis that had not been made before death. (Kernicterus is the name given to brain damage resulting from bilirubin concentrations.) He wondered what the long range effects of mild kernicterus on premature children that survived would be.

At one time, it was thought that kernicterus and hyperbilirubenia were associated only with Rh negative mothers who carried Rh positive foetuses. Among others, McKusick (14) in Human Genetics reports the following:

> "Materno-fetal incompatibility for the ABO blood groups is known to lead to early fetal death and abortion. It has been estimated that as many as 5 per cent of conceptions are lost through ABO incompatibility."

The question arises, "What if the infant survives and the incompatibility is undetected?"

It is this researcher's opinion that the survivors become reading disability cases. The growing body of research in this area of blood incompatibilities indicates that others think so too.

III CHARACTERISTICS OF MISSISSIPPI CHILDREN WITH READING-LEARNING DISABILITIES

A. AS DESCRIBED BY PARENTS

The reading-learning disability syndrome described by the Mississippi Association for Children with Learning Disabilities in their pamphlet Key To Their Future is also a description of the children seen at the MSCW Reading Center from 1966-1972. Excerpted below are the mothers' perceptions of the difficulties two children were experiencing. One mother described her child's difficulties this way:

(GENERAL BEHAVIOR): "Teachers say he is a day-dreamer, will not pay attention, and never finishes his work."

(GRADES): "He is failing everything this year. One month he comes up little in a subject the next month he drops way down."

(READING): "He has much trouble with his reading and has no sense of sound when I spell the words to him."

(SPELLING): "...spelling is terrible. We study the words for almost a week. I think he knows them - then when he goes to write them on paper most of them are wrong."

The other mother reported these difficulties:

I. Reading:

A. Reads some words backwards: was, saw, no, on, out, etc.

B. He should know phoenetics, but has trouble saying word after sounding.

C. Gets frustrated when he doesn't know a word and doesn't want to read afterwards.

D. Knows words on flashcards, but has difficulties reading in a book.

E. Confuses look-alike letters and sounds.

II. Writing

A. Confuses some letters, d,b,g,q, and writes them backwards.

B. Writes numerals backwards, especially after 10.

In addition to the school difficulties, case history forms asked parents to identify on a check list the behavioral and emotional characteristics they had noted in the child. Table VI shows the characteristics noted and the percentage of children who exhibited the characteristic.

As can be seen in Table VI, no one characteristic is typical of even the majority of the children. Daydreaming, being nervous, and being frightened by some T.V. shows (Wizard of Oz, Lassie, Dark Shadows) was characteristic of 39 per cent of the 323 cases for which data was available.

TABLE VI

BEHAVIORAL AND EMOTIONAL CHARACTERISTICS OF CHILDREN SEEN AT MSCW READING CENTER (1966-1972) N = 323

	N	%
I. Lacks Confidence - Withdraws		
a. Plays with younger children	42	13
b. Shy	66	21
c. Daydreams	102	32
II. Is nervous		
a. Nervous	123	39
b. Bites nails	73	23
III Is fearful		
a. Afraid of dark	79	24
b. Has been frightened by T.V. shows	127	39
IV Is overly aggressive		
a. Annoys or antagonizes other children	39	12

It is assumed by the author that the children developed a lack of confidence in themselves, and became nervous and fearful because of repeated failure in school and at home. It is most difficult to get such children to attempt any new work that looks difficult to them. They will hide, feign illness, cry, and become mute when they feel the reading task will produce another failure.

Even with a 100 per cent reinforcement schedule, several children refused to move up to more difficult materials when they noted that the reading level was higher than the one they had been on before.

In the next section, characteristics found in the evaluations will be presented and discussed.

B. CHARACTERISTICS EXTRACTED FROM EVALUATION TESTS

As can be seen in Figure 3 below, the median age of the sample was 9 years 5 months, and the median grade placement was fourth grade - fifth month. The average intelligence quotient was 105. (A quotient of 100 is the score right in the middle of the scores that 68 per cent of the subjects who take the test will make.)

Total number	= 377
Median Age	= 9 years 5 months
Median grade placement	= 4.5
Number retained in school one or more years	= 193 or 51 per cent

Figure 3. Evaluation Sample (1966-1972)

One hundred ninety-three or 53 per cent of the sample had been retained one or more years in school.

TABLE VII

EVALUATION TESTS USED

ABILITY TESTED	NAME OF TESTS
Word Recognition in Isolation	Botel Silvaroli Word Recognition Test
Silent Reading -Vocabulary and comprehension	California Reading Test (Lower Primary through Advanced form) Gates - McGintie (A-E forms) Iowa Basic Skills Reading Test (Grades 3-9)
Spelling - Ability to spell words in lists	Silvaroli Spelling Inventory Durrell Spelling Test Informal Spelling Inventory
Vision	Keystone Telebinocular Test Gray Oral Reading, Spache Reading Tests } For Telebinocular
Intelligence	Slosson Intelligence Test
Visual-motor abilities	Neurological Organization Test (Delacato, 1959)

Table VII shows the abilities evaluated and the names of the tests that were used to secure information. A summary of information obtained can be seen in Table VIII.

TABLE VIII

SUMMARY OF SIGNIFICANT CHARACTERISTICS

OBTAINED FROM MSCW READING

CENTER EVALUATIONS FROM 1966-1972 (N = 377)

	CHARACTERISTICS	NO. EXHIBITING	%
1.	Significant loss in Reading 1 to 12 years loss	285	80
2.	Significant loss in spelling 1 to 7½ years	284	83
3.	Visual Difficulties N = 369	328	90
4.	Speech - Articulation Defects	102	26
5.	Hearing Loss (Mild)	12	3
6.	Neurologically Disorganized	376	99

READING ACHIEVEMENT

The scores on the silent reading tests were used to determine the amount of reading achievement loss. As can be seen in Table VIII, 285 or 81 per cent of 354 children tested in silent reading showed a loss of 1 to 12 years in reading achievement. Of the remaining 69 children whose loss was not considered significant by the researcher, 17 were reading at a level equal to their age-grade placement; 52 averaged a half year's loss. Despite a non-significant loss in achievement, the 69 children were having some difficulty with school work.

SPELLING ACHIEVEMENT

Of the 332 children to whom spelling tests were administered, 284 or 71 per cent were 1 to 7½ years behind expected age/grade performance. Of the remaining 48, 22 were one-half year behind and 26 showed no loss in achievement.

OTHER CHARACTERISTICS

The characteristic that came closest to being universal was that of neurological disorganization. Only 1 child tested was completely organized neurologically. All of her scores were average or better for age/grade placement, and she had no visual or speech difficulties. She was referred because her teacher found her unresponsive in group situations in school.

Another characteristic that was higher than anticipated was that of visual difficulties; 90% of the 364 children had some difficulty according to results obtained from the Keystone Telebinocular tests. Only about one-fourth of the sample had accompanying speech-articulation defects.

A ciscussion of the various findings appears in the sections that follow.

1. SCHOOL RETENTION AND READING ACHIEVEMENT

Many of the children who have been evaluated at the MSCW Reading Center were brought by parents concerned about the lack of progress despite the child's having been retained in school and having attended summer school for several years. Others came because the school was threatening retention. Most of the requests for evaluation are initiated after the first two report card periods each year.

The assumptions of the school are as follows. (as told to me by principals and teachers)

1. A school grade has certain standards for reading achievement that must be met by all children.
2. Children who do not do so should spend another year trying to meet the standards.
3. Work will be easier for them since their reading levels will be nearer that grade level in which they are retained.

4. The child might catch up to where he should be with another year.

It has been the contention of the researcher that such assumptions were not valid. When parents have asked for advice, they were told that despite continuing difficulties the child would make as much progress in the next grade level.

Table IX illustrates that school official assumptions are not valid. Of the 377 subjects evaluated, 193 had been retained one or more years in school. The lower age in the age range is the normal age for children in that grade. As can be seen in Table IX, retention of children leads to some children being 3 to 4 years older than most children in the class. Many of these children make up for their ego losses by annoying and antagonizing younger children in their class.

In addition to their ego losses, children who are retained appear to suffer a further loss in reading achievement. In grades 1-3, Table IX shows that the average word recognition and silent reading achievement of children who were retained was the same as the achievement of the children with reading difficulty that had not been retained. In the third grade, while the latter group was only 1 year behind, the retained group was now 2 years behind. Thus instead of improving their position relative to other children in class they were in a lower position.

After grade 3, the reading achievement of the retained group begins to drop lower than those that were not retained. As can be

noted in Table IX, by sixth grade it is approximately 1 year lower. By 10th grade, it is 3 years lower. The obvious conclusion, then, is that retention further depresses the reading achievement of children. Although being promoted did not solve the reading-learning disability of the children, those who were not retained reached a higher average reading level by Grade 8 than those who were . . retained.

The researcher suggests that schools take a further look at their promotion-retention policies. Besides the significantly negative effect on learning, the retention of the 193 children in this sample represents a significant economic cost (1) $134,328 per year for each extra year the child spends in school. (The cost figure is based on the average of $696 yearly per pupil expenditure in the U. S.)

TABLE IX

COMPARISON OF READING SCORES FOR CHILDREN RETAINED IN SCHOOL TO THOSE THAT HAD NOT BEEN RETAINED WHEN EVALUATED AT MSCW READING CENTER

(1966-1972)

GRADE	NO.	AGE RANGE	NO. RETAINED	% RETAINED	AVERAGE READING LEVELS FOR NOT RETAINED W.R.[1]	S. R.[2]	RETAINED W.R.	S. R.
1	46	6-3 to 8-6	15	33	(1.4)-		(1.4)-	
2.	78	7-1 to 10-5	42	54	1.8	1.8	1.8	1.9
3.	51	8-1 to 11-9	33	65	2.5	2.5	2.5	2.5
4.	65	9-1 to 12-2	37	57	3.4	3.5	3.2	3.4
5	45	9-11 to 12-10	20	45	4.3	4.4	4.2	3.9
6	28	11-1 to 13-1	11	39	4.9	5.2	3.6	3.8
7.	24	12-3 to 15-10	13	54	5.1	5.3	4.3	4.6
8	15	13-4 to 15-9	6	40	6.9	7.6	6.8	6.7
9	6	14-0 to 17-10	5	83	(Sample too small)			
10th above	15	15-1 to 22-6	12	80	9.3	10.1	6.0	6.8
	N=377		N=193	Av=51%				

1 W.R. = Word Recognition

2 S. R. = Silent Reading

2. INTELLIGENCE AND READING ACHIEVEMENT

Numerous reading studies have attributed losses in reading achievement to low intelligence. Because of these studies, teachers presently make these assumptions:

a. Intelligence tests measure a child's learning capacity.

b. If a child has an adequate intelligence test score but lower than expected reading achievement, he is thought to be lazy or emotionally blocked from reading.

c. If a child has an inadequate intelligence test score, and a low level of reading, he should be in special education for he probably will not learn to read.

d. If a child can't read well he will be unable to learn academic content.

Assumption a views intelligence as a characteristic fixed by heredity and immune to change. Assumptions b and c indicates the belief that normal intelligence produces normal learning in all areas. Asumption d indicates a belief that all learning is obtained through reading. Because of these beliefs, there has been a tendency to reject the reading-learning disability syndrome as a real syndrome and to accuse parents of being unable to accept the reality of their child's low intelligence.

The evidence accumulated in this research and other related research (2) done by the author supports the reading-learning disability syndrome as a legitimate one. Intelligence test measurements were made on all 368 children. The Slosson Intelligence Test, because it has a high correlation to the Stanford Binet and WISC, was used as the measuring instrument. Questions are read aloud to the child by the examiner. The following abilities are tested by the Slosson.

1. Long-term language memory
   a. word meanings (destroy means?)
   b. relationships (sugar is _____?)
   c. meanings of time and measurement concepts (days in a week?)
2. Short-term memory - repeating in proper sequence
   a. 3-9 digits forwards
   b. 3-9 digits backwards
   c. sentence order (6-13 words)
3. Conceptualization ability - telling how things are alike or different
4. Quantitative or mathematical reasoning (Convergent thinking)
5. Visual-motor matching - drawing visual forms to match those given on sheet

All of the items except the short term memory tests are subject to being learned via school instruction. It appears that "intelligence", thus, is a collection of learned abilities; moreover, to demonstrate their "intelligence", the children had to have language. It follows, then, that "intelligence" tests are measures of a child's oral language development. Since the reading disability child does not have to read answers on the Slosson, he demonstrates normal or better "intelligence" in relation to other children his chronological age.

Having established "intelligence" as a collection of learned abilities, it is no longer feasible to assume that it is inherited or fixed. Who can establish a child's not being able to tell how a cat and a dog are alike as the cause of a reading disability?

TABLE X

INTELLIGENCE TEST SCORES OF 372
CHILDREN EVALUATED AT
MSCW READING CENTER (1966-1972)

Age Level	Number in I. Q. Ranges: Above Average 150-116	Average 115-95	Low Average 94-80	Below Average 79-60
6-0 to 6-11	9	12	8	-
7-0 to 7-11	3	29	4	1
8-0 to 8-11	14	54	4	-
9-0 to 9-11	9	41	14	1
10-0 to 10-11	7	31	7	3
11-0 to 11-11	9	22	11	2
12-0 to 12-11	4	12	8	1
13-0 to 13-11	4	9	5	1
14-0 to 14-11	-	5	2	-
15-0 to 22-6	-	14	11	2
Totals	59 (16%)	229 (62%)	74 (20%)	11 (2%)

I.Q.'s of MSCW SAMPLE

Did 377 children at MSCW exhibit normal or better "intelligence" on the Slosson? Table X shows the obtained intelligence scores by age group and score ranges. I.Q. is the abbreviation for intelligence quotient. It is a mathematical ratio of mental age to chronological age.

Table X shows the meaning attached by psychologists and teachers to various I.Q. scores. An average I. Q. will be shown by a score of 85 to 115 to allow for errors in measurement that any test is subject to. About 68% of the subjects who take the test will score in the 85-115 range. In Table X, the average range is broken into two sets and extended down to 80 as the 80 score is the cut off point for being placed in an Educable Mentally Retarded class.

As can be seen in Table X, 98% of the 372 children had average or better intelligence quotients. The MSCW sample fits the description given by the National Advisory Committee on Dyslexia and Related Reading Disorders in their 1969 publication, Reading Disorders in the United States (1). The committee estimated that approximately 15% of the school population conforms to the following description:

> "...individuals who in spite of apparently adequate intellectual and emotional stability

exhibit difficulties in learning to read within a teaching program that proves effective for most children."

Figure 4 gives additional illustrations of why I.Q. is not a proper predictor of reading ability. Child 1 with a 77 I.Q. had a higher reading level than the child with a 96 I.Q. Cases 3 and 4 had approximately the same I.Q., but child 3's reading level was depressed because he was in a special education class.

				Reading Level		
Child	C.A.	Gr.	I.Q.	W.R.	S. R.	Spelling
1	9-2	2.8(R)	77	2.2	2.2	2.3
2	9-2	2.8(R)	96	1.4	1.5	1.0
3	8-10	Sp. Ed.	91	1.6	1.0	1.0
4	9-3	3.9(R)	90	3.0	2.4	3.0
5	13-5	Sp. Ed.	89	1.7	2.5	1.0
6	7-5	2.7	123	1.2	-	1.0
7	7-1	2.5	86	1.6	1.3	1.0

FIGURE 4

I.Q. and Reading Scores for Selected Sample

Child 5, despite an I.Q. advantage of 12 points and 4 years of chronological age, was at the same level as child 1. The depressing effect of special education can be seen again. Child 7,

who is younger and has an 86 I.Q., had a higher reading level than child 6 with an I.Q. of 123. Apparently, the difference in I.Q. achievement is not related to reading achievement in these cases.

What good are I.Q. tests then? This researcher considers the results as proof that reading comprehension is no real problem to most reading-learning disability children. Reading content graded at their chronological age level would be understood if the children could read it. Their real difficulty seems to be in developing an adequate enough sight vocabulary to move from one difficulty level to the next; thus reading achievement test scores are depressed due to their inadequate sight vocabulary.

Another use that might be made is to use the I.Q. score as an indicator for further testing. I.Q. scores below 95 begin to indicate losses in short term memory, inferental thinking, and visual memory. Further testing should be done to determine the causes of such losses.

3. NEUROLOGICAL DISORGANIZATION, VISION AND READING ACHIEVEMENT

A. Definition, Rationale for and Results For Neurological Organization Test

One of the tests given in the evaluation was the Neurological Organization Test adapted from Carl Delacato's (3) book, The Diagnosis and Treatment of Reading and Speech Disorders, 1964. (Directions for test administration and scoring may be seen in Appendexes D, E, F.) The test was administered to 103 cases in a Title III project in Monroe County and neurological disorganization was found to be a universal characteristic of the group (2).

Neurological disorganization refers to a central nervous system dysfunction characterized by: 1) inadequate mobility, 2) inability to follow objects without losing track, 3) inadequate binocularity, 4) inadequate depth perception, and 5) incomplete or mixed laterality. The term was first introduced by Delacato in 1964; it has since been the subject of much controversy and ignorance.

"Inadequate mobility--visual pursuit ability and mixed laterality are not causes of reading disabilities but are indications of dysfunction of the central nervous systems known as neurological disorganization." Simultaneous vision, binocular vision at both farpoint and nearpoint, depth perception, and color perception are also reflections of brain development.

The aforestated aspects of vision are learned after the different levels of the brain are developed. (See Neurological Organization Score Sheet in Appendix E.)

TABLE XI

VISUAL DIFFICULTIES NOTED IN CHILDREN EVALUATED AT MSCW READING CENTER (1966-1972) N = 364

Type of Visual Difficulty	No. Exhibiting	%
1. Simultaneous Vision		
a. no vision in one eye	38	10
2. Binocularity		
a. Fusion unsatisfactory (far point or near point)	162	46
b. Vertical Convergence Unsatisfactory	28	8
c. Lateral convergence unsatisfactory	161	46
d. Suppressing vision in one eye	78	22
3. Depth Perception	104	30
4. Color Perception	49	11
5. Nearsightedness	34	9
6. Farsightedness	52	11
7. Had glasses	39	10
8. Peripheral vision difficulties	18	5
9. Couldn't close one eye when sighting	21	6
10. Total number with some type visual difficulty	328	90

Table XI indicates the types of visual difficulties found as part of the neurological disorganization in 364 cases. As can be seen in Table XI, 328 or 90 per cent had some type visual difficulty. The complete chart of visual difficulties may be seen in Appendix 6.

Simultaneous vision problems occurred with 38 or 10 per cent of the subjects. Binocular difficulties were noted in 46 per cent of the cases. Depth perception losses were found in 30 per cent of the children, and color perception difficulty was noted in 11 per cent.

As can also be seen in Table XI, acuity losses (nearsightedness and farsightedness) was a problem with approximately 10% of the children, and only 39 had glasses.

Two other problems that occurred in about 5 per cent of the subjects probably are related. Eighteen children showed some restriction of peripheral vision, and 21 children couldn't close one eye when sighting. The percentage of the latter might have been higher, but this disability was discovered accidentally only 2 years ago. The researcher feels that these two signs may be indications of organic damage.

Many "authorities" continue to discount vision as a major factor in reading disabilities. If visual difficulties are treated as signs of neurological disorganization, however, there does seem to be a significant relationship.

RATIONALE FOR

The idea that neurological disorganization may be related to reading, speech and language disorders is based upon assumptions that are logical and verifiable. These assumptions are:

a. Brain maturation proceeds in an orderly manner from the pons, to the midbrain, to the cortex.

b. As each level of the brain matures, further development occurs as a result of environmental stimulation that causes neuronal systems to become operative as part of a visual-motor response pattern. For instance, after the pons matures, he may see something across the room that stimulates him to respond by crawling on his stomach to get it.

c. A central nervous system that is properly organized causes a child when moving to learn to use the opposite arm and leg together in what is known as a cross pattern.

d. Visual functions and visual-motor response systems develop parallel to mobility and result from brain maturation at different levels.

e. After a child reaches age 7, if the central nervous system is organized properly, he will

show a consistent preference for the eye and limb on the same side in any activity that involves eye-limb coordination.

f. Inadequate neurological organization may be a function of child's being deprived of environmental stimulation, having received physical damage to the brain, or a combination of both.

g. Language-visual functions such as reading and language-motor systems such as writing are affected by inadequate neurological organization.

B. RESULTS OF GIVING NEUROLOGICAL ORGANIZATION TEST

Results of testing at the MSCW Reading Center indicate further support for the aforestated assumptions. The researcher decided to quantify test results in order to derive normative scores for future use.

The degree of disorganization was determined by assigning numerical values to each of the subtests and adding up scores for tasks that were satisfactorily performed. Table XII indicates the value assigned to each subtest. A total score of 22 points represents completed neurological organization.

The assignment of point values was arbitrary: in addition there probably needs to be an addition made for two other difficulties - speech-articulation defects as indicative of disorganization in the language-motor area and not being able to close one eye when sighting as an additional pons task. Also needed are norms for children who are considered average and superior readers.

TABLE XII

Numerical Values Assigned to Subtests of Neurological Organization Test

	Value
Pons Tasks:	
1. Crawling on stomach in cross pattern	1
2. Simultaneous vision (Telebinocular Test 1)	1
Midbrain Tasks:	
1. Crawling on hands and knees in cross pattern	1
2. Following an object held by himself through four planes: vertical, horizontal, circular and diagonal	4
3. Binocular vision: Telebinocular Tests of lateral and vertical convergence and fusion at both farpoint and nearpoint.	5
Cortical Tasks:	
1. Walking in a cross pattern	1
2. Depth perception	1
3. Color perception (figure-ground discrimination)	1
4. Following an object held by tester through four planes	4
Laterality (all or none)	3
Shows consistent preference for eye, hand and foot on same side of body.	

The results of the test with 389 children indicate again that neurological disorganization was the universal characteristic of the sample; 388 or 99 per cent had neurological organization scores from 2 to 19. Only 1 had a perfect score of 22. No child was completely disorganized but four children had scores of 2, these were children with diagnosed cerebral palsy who had extreme motor difficulties and essentially vision in only one eye.

Table XIII shows the number of cases that obtained N/O scores of 4 - 19. Other researchers in the past have used mobility 2 (crawling on the hands and knees) and mixed laterality as the critical signs of disorganization. As can be seen in Table XIII, the subtests listed below appear to be better indications of neurological disorganization:

1. Inadequate crawling on stomach
2. Inadequate visual pursuit when object is controlled by subject
3. Inadequate visual pursuit when the object is outside the control of the subject

The lower the score the higher the frequency of inadequate fusion, convergence and depth perception. Approximately 50% of the sample demonstrate the characteristics cited above.

TABLE XIII

RESULTS OF NEUROLOGICAL ORGANIZATION TEST WITH MSCW READING CENTER SAMPLE (1966-1972)

N/O Scores	No. of Cases	% Failed Mobility			% Failed Visual Pursuits		% Visual Difficulties			
		1	2	3	1	2	Fusion	con-ver-gence	Depth Percep-tion	Color Percep-tion
4	5	100	100	60	100	100	80	60	80	20
5	4	100	100	100	100	100	100	75	25	25
6	16	94	56	38	94	88	60	69	56	25
7	20	95	60	55	95	85	70	55	55	10
8	39	100	67	36	95	93	33	33	51	30
9	43	100	50	30	98	93	35	23	33	25
10	38	95	42	30	97	100	34	39	30	21
11	36	81	42	25	86	72	42	42	38	3
12	25	92	52	12	80	40	48	40	32	12
13	27	100	40	10	88	63	41	44	22	15
14	26	92	8	8	60	24	40	32	28	4
15	23	48	22	20	26	22	65	62	24	4
16	25	72	24	24	20	24	28	28	8	20
17	24	60	24	8	12	16	16	16	12	0
18	17	65	0	4	4	4	24	6	6	6
19	6	17	0	0	0	0	0	17	17	17
	374									

Table XIV shows laterality patterns from 383 tests. There were 16 distinct patterns. One of the mistakes made by other researchers has been to use only the sighting-eye test results to indicate eyedness. As can be seen in Appendix D, eyedness tests determine the preferred eye for binocular and monocular sighting, the preferred eye for reading, and the preferred eye for writing. In 356 of the 383 cases, eye preference changed (was mixed) according to the function being performed.

The most frequent laterally pattern was right handed, mixed footedness, and mixed eyedness. Pattern 1 and 2 combined together account for 72 per cent of the cases. There were only 4 cases of pattern 9 (right handedness, right footedness, and complete left eyedness). This pattern can occur usually only when the child has amblyopia.

The pattern that has the highest probability of being reflective of organic brain damage is Pattern 3 (mixed handedness, mixed footedness, and mixed eyedness). Case history data generally indicated a high abnormal mobility, changes in handedness, and diagnosed minimal cerebral dysfunctions for the 42 children with pattern 3. Long term remedial programs may be necessary for these cases.

TABLE XIV

LATERALITY PATTERNS OF CHILDREN

EVALUATED AT MSCW READING CENTER (1966-1972)

Type Pattern			Number of Cases	%
Handedness	Footedness	Eyedness		
1. Right	Mixed	Mixed	162	42
2. Right	Right	Mixed	116	30
3. Mixed	Mixed	Mixed	42	11
4. Left	Mixed	Mixed	13	3
5. Mixed	Right	Mixed	12	3
6. Right	Mixed	Right	7	2
7. Left	Left	Mixed	7	2
8. Right	Mixed	Left	6	2
9. Right	Right	Left	4	1
10. Left	Mixed	Right	4	1
11. Mixed	Left	Mixed	3	-
12. Mixed	Mixed	Left	2	-
13. Right	Right	Right	2	-
14. Right	Left	Mixed	1	-
15. Left	Mixed	Left	1	-
16. Mixed	Right	Left	1	-
			N = 383	

C. NEUROLOGICAL ORGANIZATION AND READING

The major question that needed to be answered was whether neurological organization scores would be reflective of significant losses in reading achievement. Table XV shows the range of neurological organization scores, grouped according to grade placement of the sample. Also shown in the table is the percentage of children showing significant losses (1 year or more) in reading and spelling. As can be seen, of the 372 for whom adequate scores were available, 80 per cent indicated a significant loss in reading; and 83 per cent, a significant loss in spelling. The conclusion to be drawn from these results is "Neurological Disorganization will lead to significant losses in reading or spelling in 8 out of 10 cases."

TABLE XV

NEUROLOGICAL ORGANIZATION AND PERCENT OF CHILDREN WHO SHOWED LOSSES IN READING AND SPELLING (N=372)

Grade	Age Range	N/O [1] Score Range	% with Significant Losses in Reading	% with Significant Losses in Spelling	N
1	6-3 to 8-6	4-13	100[2]	100	46
2	7-1 to 10-5	6-18	80	82	78
3	8-1 to 11-9	5-19	80	73	51
4	9-1 to 12-2	2-18	75	80	65
5	9-11 to 12-10	4-19	60	90	45
6	11-1 to 13-7	2-19	74	80	28
7	12-3 to 15-10	7-18	83	86	24
8	13-4 to 15-9	9-19	80	75	14
9	14-0 to 17-10	7-19	100	100	6
10th & above	15-1 to 22-6	7-20	93	80	15
		Av %	80	83	372

1. N/O = Neurological Organization

2 - 100% of 15 children retained in Grade 1

a. Children with scores of 6 or below on the N.C. test will be unable to learn to read.

b. Children with scores of 7-14 should learn to read some if poor teaching, cultural deprivation, or speech disorders do not reduce desire and opportunity to do so.

c. Children with scores of 15-19 should (given good instruction) achieve a reading level that shows no more than 1-3 months loss per year.

d. Children with scores of 22 should achieve an average or better reading level if good instruction is available.

The extent to which these predictive values held up with the MSCW sample can be seen in Table XVI which shows the median Neurological Organization Score, number of children in each grade level and the average word recognition and silent reading scores for the groups. A comparison is also made of children who were retained to those who were not.

The predictive values of the neurological scores seemed to hold up with the MSCW sample. With the exception of the 7th grade sample, there is a steady growth in median neurological organization scores and a corresponding growth in average reading

TABLE XV

MEDIAN N/O SCORES AND AVERAGE READING SCORES OF MSCW CHILDREN (1966-1972)

Ave Grade Placement	No. of Cases	N/O Score Median	Reading Levels Average		No. of Cases Retained	N/O Score Median	Reading Levels Average	
			W.R.[2]	S.R.[3]			W.R.	S.R.
1.5	46	8.5	pp3[4]	--[4]	15	8.5	pp3	--
2.5	78	9.5	1.8	1.8	42	9.5	1.8	1.9
3.5	51	11.5	2.5	2.5	33	9.5	2.5	2.5
4.5	65	12.5	3.4	3.5	37	10.5	3.2	3.4
5.5	45	13.5	4.3	4.4	20	13.5	4.2	3.9
6.5	28	14.5	4.9	5.2	11	14.5	3.6	3.8
7.5	24	11.5	5.1	5.3	13	11.5	4.3	4.6
8.5	15	15.5	6.9	7.6	6	13.5	6.8	6.7
9.5	6	15.5			5			
12.5 10th gr. & above	15	16.5	9.3	10.1[5]	12	14.5	6.0	6.8

1. Neurological Organization
2. Word Recognition
3. Silent Reading
4. pp3 = Pre-primer 3

levels. By grade 12.5 the median N/O score is 16.5, and the average loss for the 3 not retained in school was about 2½ years.

Another important finding revealed in Table XVI is that there is a maturation factor involved; growth in neurological organization generally comes as the child grows older. Sixth grade should be the time that many children make rapid improvement in their reading and spelling levels. Other researchers have reported large gains for reading for children in grades 6-9; the improvement was thought to be the result of the reading method employed. It appears that neither they nor the MSCW Reading Center can take full credit for the gains.

It is also obvious in Table XVI that children whose neurological organization did not improve with age were more often retained in grades 3, 4, 8 and high school. Median scores are 2 points lower in those grades for children who were retained; notice, too, that average word recognition and silent reading results are lower. It appears, therefore, that at least 50 per cent of the sample shows less than normal improvement in neurological organization as they grow older. Noteworthy, too, is the fact that maturation does not produce complete neurological organization.

Another conclusion that can be drawn from the results of Table XVI is that many children with sufficient neurological organization in reading to be within 1 to 2 years of grade placement expectations are not receiving the instruction needed to do so. The children and parents in the sample had become so defeated

and discouraged by Grade 6 that they were unable to believe that additional effort would accelerate reading progress. School records, because of the insistence that children take achievement tests for that grade, show many children going backwards each year.

Because of the inconsistency and lack of instruction, it is difficult at this time to determine what loss in reading achievement might be solely attributable to the lack of neurological organization. The following poor instructional practices were derived from interviews and examination of reading materials being used in the schools.

1. Inconsistent development of basal reader instruction; basal reader series changes from grade to grade.

2. All children assigned same reading materials - no attempt to determine instructional level of child.

3. Homework that involves reading content too difficult for child.

4. Assigning lists of words to be learned in isolation.

5. Word attack instruction scattered and unrelated to reading.

6. Physical punishment for failure to get work done.

7. No catch-up program - once the child gets behind in reading he's always behind.

8. Rejection of child by teachers and Peers

9. Inadequate communication between home and school.

10. Refusal by teachers to give special instruction on the grounds of having too many children.

Our experience with tutorial instruction indicate that all children can be taught to read. Some children who have the good fortune to get a teacher who motivates them to put forth more effort show large gains in reading without anything else being done. Until the amount of reading achievement loss with superior instruction is determined, there will probably always be some controversy over the real cause of reading disabilities.

IV RESULTS OF REMEDIATION

TREATMENT WITH MSCW SAMPLE

Children in the Columbus area that show significant losses in reading are tutored individually at the MSCW Reading Center by elementary education majors. Forty-five minute individual tutoring sessions are scheduled Monday through Thursday. Children are scheduled during regular school hours when the school feels that the child's schoolwork will not suffer; cost to parents is approximately $6.75 per week.

Remedial programs are designed cooperatively by the Director and Assistant Director of the Center. The forty-five minute period is broken into 3 subblocks of 10-15 minutes each: 1) comprehension building, 2) word attack instruction, and 3) neurological organization exercises.

Materials are selected for use according to the reading-spelling instructional needs determined in the evaluation. The MSCW Reading Center has samples of most reading programs on the market. In the past 2 years, the staff has developed individualized word-attack instruction and materials for use in teaching phonic analysis and syllabication.

The neurological exercises consist of the 5-step, fifteen minute routine listed below: (A complete description is contained in Appendix F.) All the exercises are done by the child himself except for number 5.

1. crawling on the stomach using a cross-pattern movement

2. Crawling on the hands and knees using a cross-pattern movement

3. walking in a stylized cross-pattern

4. visual pursuit of object held within child's hand (1 min.)

5. visual pursuit of object held in tutor's hand (1 min.)

These exercises are intended to improve the child's level of neurological organization and vision. They were usually continued until the child's performance in school became normalized and/or his visual difficulties improved. The examination of visual rechecks now indicate that reorganization is preceded by a break in fusion for a short time followed by the normalization of fusion again. When this happens, the exercises can be stopped as neurological reorganization is assumed.

No attempt is made to change handedness; no breathing exercises are included and children are not taken off music. The Stereo Reader for eye-hand coordination is used with some children if they have no fusion-convergence problems.

1.) IMPROVEMENT IN VISION NOTED

Delacato (3) stated in his 1964 book that the mobility training improved fusion-convergence abilities. The results in Table XVIII support that contention. As can be seen, visual improvement occurred in about 2 out of 3 children who did the neurological organization exercises. In many cases, these improvements were in depth perception and color perception as well as in fusion-convergence abilities.

It appears then that vision is a by-product of neurological development, and that it is subject to reorganization and improvement.

TABLE XVIII

IMPROVEMENT IN VISION NOTED IN MSCW CHILDREN AFTER NEUROLOGICAL ORGANIZATION EXERCISES

No. of Mos. on Exercises	No. of Children	No. Showing Improvement	% Showing Improvement
1 - 3	66	43	65%
3 - 8	74	49	66%
10 - 31	36	24	67%

B. THE RESULTS OF TUTORING

Table XIX below shows the time involved in tutoring, the number of children tutored, the average gains made in word recognition and silent reading, the range of reading gains, the number of children whose reading performance normalized or accelerated, and the number of children whose reading achievement equalled expectations for age/grade placement.

If remedial instruction is to be successful, the child's rate of learning to read must be normalized and accelerated. Since all the children being tutored had been diagnosed as having reading-learning disabilities, none had ever made one month's gain for one month's effort. Table XIX shows that 69 (90%) of the 77 children tutored from 1-3 months accelerated in their rate of learning to read. Fifteen (20%) reached an achievement level equal to their age/grade placement.

Of the 85 children tutored for 4-8 months in the MSCW clinic, 73 (86%) normalized and accelerated in their rate of reading acquisition. Thirty-seven (44%) reached an achievement level equal to that expected for age/grade placement.

Forty children were continued in tutoring for a year to 3 years in time. As can be seen in Table XIX, the average growth in reading achievement was 1.8 (17 months since school year equals 9 months). If all children's rates had been normalized or accelerated, the average gains would have been greater. However,

twenty-three (40%) did make normal or better progress, and 13 (33%) reached a reading level equal to their age/grade placement.

TABLE XIX

RESULTS OF REMEDIAL PROCEDURES
FOR 202 IN-CLINIC STUDENTS
AT MSCW READING CENTER (1966-1972)

No. of Months Tutored	No. of Cases	W R[1]	S R[2]	Reading Range	Normal or Better Progress	Reading at Expected Grade Level
1-3 mos.	77	0.5yrs.	0.7yrs.	0.0-2.4yrs	69 (90%)	15 (20%)
4-8 mos.	85	1.1yrs.	1.3yrs.	0.0-3.7yrs.	73 (86%)	37 (44%)
10-31 mos.	40	1.7yrs.	1.8yrs.	0.0-5.0yrs.	25 (63%)	15 (38%)
	N=202					

1 - W R = Word recognition

2 - S R = Silent Reading

Although the average of 72 per cent of the 202 cases making normal or better progress in reading for the first time since they started school is significantly high, there were 37 children who did not respond to the remedial procedures. The reasons are still unknown at this time for the 29 that persisted beyond 3 months. The results do point up again the need for more extensive allied medical and social services to pinpoint the causes of a child's disability.

Another conclusion that seems tenable is that, while the in-clinic program helped 67 children move to an achievement level that was competitive with other children their age, many of the other 100 children who did not reach that level continued to have difficulty with school work because no attempt was made to adjust science and social studies texts to their instructional level nor to make use of their ability to learn through lectures and taped lessons. Thus the in-clinic program provides a valuable support service, but is not the full solution to the problem. School systems need to make provision for within-school instruction on an individualized basis.

Further support for the above idea can be drawn from the results of remedial programs that were set up to be carried out with parental supervision.

Table XX shows the results of remedial programs attempted at home. Parents and children were taught the neurological exercises before returning home after the evaluation. After parents

had secured a tutor, advice was given on the selection of materials and instructional needs of the child. In some cases, materials from the MSCW Reading Center were loaned to the tutor. The fifty-nine children were re-evaluated every 3-6 months without charge. As can be seen in Table XX, some parents persisted for as long as 31 months.

TABLE XX

RESULTS OF REMEDIAL PROCEDURES
WITH 59 CHILDREN SET UP
ON HOME PROGRAMS

No. of Mos.	No. of Cases	Average Gains Reading W.R.[1]	S.R.[2]	Range	Normal or Better Progress	Reading at Expected Grade Level
1-3	14	0.7	0.3	0.0-1.4	11 (79%)	2 (14%)
4-8	26	0.7	0.7	0.0-2.1	15 (57%)	8 (31%)
9-13	11	1.2	1.5	0.3-2.3	7 (63%)	4 (36%)
16-31	8	1.8	1.9	0.9-3.5	2 (25%)	0 (0%)

1 - W.R. = Word Recognition

2 - S.R. = Silent Reading

Average gains in reading were not as great for these 59 children. The percentage whose rate of learning normalized or accelerated was significantly less for those children tutored from 1-8 months at home. For those who persisted from 16-31 months, only two children reached a normal level of progress.

The Title III project (2) in Monroe County tested the effect of all day instruction in a non-graded classroom. The following recommendations were made in relation to instituting school programs to help children with reading- learning disabilities:

1. Children who exhibit characteristics of reading-learning disability children should start school in a non-graded class with an all day curriculum that emphasizes language development and perceptual-motor abilities. Then they should be moved to a regular classroom, and if achievement is not normalized, given continued supplementary instruction in reading only.

2. Children between ages of 7-10 when found to be in need should receive 1 year's instruction in a non-graded class, a second year of ½ day in reading perceptual motor activities, and then continued supplementary instruction in reading only until achievement is normalized.

3. Children, 11 and up, should be given reading and perceptual-motor training but left in regular classroom. Supplementary instruction should continue throughout their public school life if necessary.

If the above recommendations are followed, the number of children who need very specialized clinical help could be reduced to a very small number.

C. FOLLOW-UP RESULTS

An attempt was made to follow-up the children who had been evaluated at the MSCW Reading Center since 1968. Three hundred questionnaires were sent out. (See Appendix H) Because of address changes and the high mobility of Air Base personnel, 100 were returned by the post-office as not forwardable. Of the remaining 200, 89 were returned. Table XXI gives the results of the questionnaire information that referred to reading achievement.

There is no way to tell why 100 questionnaires were not returned, therefore any generalization drawn from this information is subject to verification.

Table XXI results show that the MSCW Reading Center evaluation-remediation results was successful to the extent that 74 of the 89 children were doing satisfactory work in school as indicated by grades and graduation from school. Twenty-nine children had

maintained normal or better reading levels. Thirty-seven children were still not reading at expected age/grade levels, but were able to maintain satisfactory marks.

However, 16 children were still having a difficult time in school and with reading. They still very much need support from the school which is presently unavailable. They and their parents still find school a trying and anxious experience.

In contrast, quotations from a letter below express the feelings from a parent for whom the program was successful:

> "I do not like to think what would have happened to our child's emotional and mental stability had we not been directed to your clinic."
>
> " ---------- is now a well adjusted, self-confident little girl as compared to the shy, withdrawn child she was becoming due to her reading difficulty."

TABLE XII

FOLLOW-UP INFORMATION ON

89 CHILDREN EVALUATED AT

MSCW READING CENTER (1968-1972)

SCHOOL - READING STATUS	FORMER IN-CLINIC CASES	FORMER HOME PROGRAM CASES
1. Present School Achievement Satisfactory - Reading Level Normal	14	15
2. Present School Achievement Satisfactory - Reported Reading Level Still Below Age/Grade Placement	21	16
3. Present School Achievement Unsatisfactory - Reading Still Below Age/Grade Placement	9	7
4. Graduated From High School	4	4

V SUMMARY AND CONCLUSIONS

A. SUMMARY

The purpose of this study was to collect information that would answer these questions about Mississippi children who were evaluated at the MSCW Reading Center from 1966-1972:

1. What were the etiologies of their reading-learning disabilities?

2. What were the characteristics of Mississippi children with reading-learning disabilities?

3. What remedial programs were prescribed?

4. How successful were the remedial programs?

Data was collected from the case histories, evaluation results, and follow-up reports for 389 children ages 6 through 22 years - 6 months. All were from Caucasian, middle-income families. A summary of the results appears in each of the four preceding sections.

Of the 389 cases included in this study, 372 did have reading-learning disabilities. Fifty-one per cent (193) had been retained at least one year in school. The Characteristics they displayed were very much like those described by other researchers for

dyslexic, hyperkinetic, minimally brain damaged, and perceptually handicapped children.

B. CONCLUSIONS

On the basis of the evidence obtained, the following conclusions seemed warranted:

1. Although not universal, the general origin of reading disabilities appears to be parental blood incompatibilities complicated further by various pre-natal difficulties such as anemia, drugs, prematurity, Caeserean deliveries, breech presentations, and prolonged labors.

2. The effects of the aforegoing etiology is neurological disorganization. Ninety-nine per cent of the 389 children were neurologically disorganized. In eighty per cent of the cases, the disorganization led to 80 per cent of the children having significant losses (1 year or more) in reading and spelling.

3. Accompanying the reading-disability may be a history of allergies, speech-language defects, a history of hyperactivity, and various visual difficulties.

4. Ninety-eight per cent of the children had average or better intelligence. Intelligence does not predict reading achievement in these cases. There is a question as to how it could anyway since I.Q. scores are based on the language understanding that a child has learned rather than what his capacity for learning is.

5. School retention causes further losses in reading achievement. After grade 3, the average achievement of reading disabled children who were retained is lower than the reading disabled who were not retained.

6. The in-clinic remedial program at the MSCW Reading Center was successful in normalizing and/or accelerating the rate of learning to read in 72 per cent of the cases. The best results, in terms of helping the child reach a reading level equal to his expected age/grade placement, was with children who persisted in the clinical program for four to eight months.

7. The neurological exercises were effective in improving the visual status of about 67 per cent of the children who persisted with them for at least three months.

8. Remedial programs instituted under parental supervision at home were not as successful as the in-clinic program. Parents should not be expected to perform functions best handled within schools.

9. The follow-up study indicates that gains made from the remedial programs are retained.

10. Although the MSCW Reading Center appears to be providing a successful support service for 72 per cent of its clients, the 37 children that were not significantly helped represents a continuing need for better research to determine the cause.

11. It is hard to determine what the exact effect of neurological disorganization on reading achievement is because poor teaching and the frustration of failure depress reading achievement also. Until reading-learning disability children receive the individualized instruction they need in school, no treatment program will be completely successful.

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APPENDIX G

VISUAL DIFFICULTIES OF CHILDREN EVALUATED
AT MSCW READING CENTER (1966-1972) N = 389

	DIFFICULTY	NO.
1.	Farpoint fusion	
	a. unsatisfactory	42
	b. very unsatisfactory	9
2.	Nearpoint fusion	
	a. unsatisfactory	25
	b. very unsatisfactory	16
3.	Suppresses vision in right eye when right handed	54
4.	Suppresses vision in left eye when left handed	8
5.	Alternating vision	16
6.	Vertical Convergence out	28
7.	Lateral Convergence out at	
	a. farpoint	88
	b. nearpoint	73
8.	Depth perception difficulty	96
9.	Color perception difficulty	49
10.	Couldn't take farpoint accrity tests	2
11.	No vision in:	
	a. right eye	22
	b. left eye	16
12.	Mildly nearsighted - both eyes	27
13.	Mildly farsighted - both eyes	50

APPENDIX G
(continued)

	DIFFICULTY	NO.
14.	very nearsighted	7
15.	very farsighted	2
16.	couldn't tell directions - had to point	85
17.	saw yellow in some circles at nearpoint	34
20.	yellow card hurts his eyes	8
21.	had glasses	39
22.	couldn't take depth perception test	8
23.	couldn't take nearpoint tests	11
24.	Peripheral vision difficulties at: a. farpoint b. nearpoint	18
25.	couldn't close one eye when sighting - closed both	21
26.	Eye injury left scar tissue	2
27.	Unknown	36

Appendix B

M. U. W. READING CENTER

CONFIDENTIAL CASE HISTORY

Dear Parents:

This questionnaire is intended to solicit information from you about factors that have been known to affect a child's learning ability. It is our hope to secure information that will give us some knowledge of his prior development and help us also plan the testing program.

We hope that you will feel free to answer all questions as accurately as possible. All information in the case history is confidential and will not be accessible to anyone else without your permission.

CHILD'S NAME_____

DATE OF BIRTH_____ AGE OF SCHOOL ENTRY_____

NAME OF PARENTS_____

ADDRESS_____ PHONE_____

I. Family Relationships:

In spaces below, list information asked for by the headings:

	Family Members	Age	Reading Ability (excellent, average, poor)	Occupation (if applicable)	Handedness
1.	Father	___	_____	_____	L R
2.	Mother	___	_____	_____	L R
3.	_____	___	_____	_____	L R
4.	_____	___	_____	_____	L R
5.	_____	___	_____	_____	L R
6.	_____	___	_____	_____	L R

II. Family History: (For "Yes" answers below, please explain)

A. Blood Type: Mother's _____ Father's _____ Child's_____

B. History of visual and/or speech difficulties in family?

C. History of left-handedness in family?

D. History of reading difficulty in family?

III. Pre-Natal History:

A. Doctor during pregnancy _____
B. Place child born _____
C. Any illness, allergy, or cold during pregnancy _____
D. Drugs taken for _____ E. Drugs for nausea _____
F. Exposed to German Measles _____ G. Any epidemics _____
H. Flu vaccine taken _____
I. Has either parent ever been anemic _____ (Yes or No)
J. Was mother's health poor during pregnancy _____
K. Was there difficulty carrying the child to term _____
L. Did mother have any illnesses during pregnancy _____
M. Did mother incur accident or injury during pregnancy _____

Peri-Natal: (Please answer Yes or No)

_____ Was labor prolonged
_____ Was labor precipitous
_____ Were high forceps used
_____ Was this a cesarean
_____ Was this a breech presentation
_____ Was child a twin (Identical or fraternal) Which _____
_____ Did child require oxygen _____ Birth weight _____

Post-Natal: (Infancy)

_____ Did child have early feeding problems
_____ Was child colicy
_____ Did child bang head frequently
_____ Was child slow in sitting up
_____ Did child cry a lot as an infant
_____ Was child too quiet
_____ Was child too active
_____ At what age was child toilet trained

IV. Health Factors:

A. Severe illness with high fevers:

Age	Illness	Noticeable Effects (if any) of Illness
___	_____	_____
___	_____	_____

B. History of allergies or asthma? If yes, describe allergy and its duration _____

C. Any operations (specify) _____

D. Head injuries _____ Age of occurence _____

E. Any convulsions or unconsciousness _____ What age _____

F. Any physical handicaps _____ Age of occurence _____

G. Ever noticeably overactive ___ Duration of _____

H. Frequent headaches _____ I. Frequently fatigued _____

J. Any indication of thyroid deficiency _____ Anemia _____

Visual difficulty _____

K. Date of last physical examination _____

Circumstances and results_____

_____

L. Current height _____ Current weight _____

Hours of sleep per night _____

M. Any medicine being taken now _____

If yes, what and why _____

V. Developmental Factors:

At what age did child perform each of the following:
(Estimate in Months)

1. Crawl (inch along floor with stomach on floor) _____
2. Creep (upon hands and knees) _____
3. Sit up alone _____
4. Walk alone _____

Has handedness ever changed _____

VI. Language Facotrs: (Estimate in Months)

A. At what age did your child begin to talk _____

B. At what age did he appear to have an unlimited vocabulary____

C. Have you ever noticed any speech defect? Yes____ No ____

If yes, indicate type_____

D. Does anyone else in the family have a speech defect? Yes___ No___

If yes, which member _____

E. Have you ever had your child's hearing tested? Yes____ No ____

VII. Describe difficulties child is having with school work:

VIII. Behavioral and Emotional Characteristics: (Please answer Yes or No)

_____ Does child seek company of younger children
_____ Does child seek company of older children
_____ Does child annoy or antagonize other children
_____ Does child day-dream
_____ Does child bite his nails
_____ Is child afraid of the dark
_____ Is child nervous
_____ Is child shy

IX. Background of Experiences:

A. With Books:

1. Do you read to the child? Often___Sometimes___Seldom___

2. Does the child "read" books by himself?
Often___Sometimes___Seldom___

3. At what age did you begin to read to your child?

B. Interests:

1. What hobbies, if any, has he developed _____
_____.

2. Is there anything that holds his attention for 30 minutes or more?_____
_____.

3. What type of play or sport does he do most frequently?
_____.

4. What type television show does he watch most frequently?
_____.

5. Has he ever been frightened by any shows? _____
_____.

MISSISSIPPI UNIVERSITY FOR WOMEN

READING CENTER

COLUMBUS, MISSISSIPPI

To the Teacher:

_____ has been referred for diagnostic evaluation of a reading problem. Your assistance will be most valuable in this diagnosis if you will furnish the confidential information asked and return it to this office.

CHILD'S NAME_____AGE___GRADE_____SCHOOL_____

SCHOOL ADDRESS_____PRINCIPAL_____TEL._____

Grades repeated or skipped:_____
History of unusual absences:_____
Changes in schools:_____

****

Standardized Test Scores:

Intelligence Tests: (Most Recent)
Name of Test_____ Date_____ Result _____
Achievement Test: (Most Recent)
Name of Test_____ Date_____ Result _____
Results:
Reading Arithmetic Spelling

Teacher's Comments: (Comment briefly on general achievement, relation with you, and relation with other children.)

Would you like a copy of our report for your records? Yes___ No___

_____
Teacher's Name

_____
Principal's Name

Principal's Comments:

Appendix D3

DIRECTIONS FOR ADMINISTERING NEUROLOGICAL ORGANIZATION TEST

by Dr. James I. Califf

Checking Pons

I. Crawling on Stomach:

Ask the child to lay down on the floor on his stomach facing you. Then ask the child to crawl. If he attempts to get up on his hands and knees, ask him to get back on his stomach and crawl.

Possible Responses:

_____1. Child cannot move
_____2. Child sticks out hands and arms, pulls with hands or elbows and drags legs behind him. (Homologous or no pattern)
_____3. Child bends elbow and leg on same side of body, moves, and then switches to the elbow and leg on the other side of the body, (Homolateral pattern)
_____4. Child bends elbow and leg on opposite sides of body, moves, and then switches to opposite elbow and leg (Cross-pattern)

Checking Midbrain

I. Crawling on Hands and Knees (Creeping):

Ask the child to get up on his hands and knees and crawl, you may have to demonstrate for some children. Have him repeat several times while you observe the movement of his hands and knees.

Possible Responses:

_____1. Child bunny hops acroos room (Homologous Pattern)
_____2. Child moves left arm and left knee and then right arm and right knee or vice-versa
_____3. Child moves right arm and left knee and then left arm and right knee or vice-versa (Cross-pattern)
_____4. A mixture of the above two depending on the speed of movement

II. Visual Pursuit:

Ask the child to stand up straight.
Tell him to extend the arm he uses for writing and make a fist of his hands.
Put pencil, point up, in clenched fist.
Cup your hand over the child's.
Tell him to keep his eyes on the end of the pencil while you move his hand. Tell him to move just the eyes and not the head.

Move the child's hand through the four planes as described for you on the exercise sheets. Watch his eyes closely.

Possible Responses:

_____1. Pass. Child can follow pencil without head movement and without losing pencil point. Eyes move smoothly in all directions.

_____2. Rough. Child can follow pencil with some head movement and without losing pencil point. One or both eyes move haltingly and with some difficulty.

_____3. Fail. Child moves head instead of eyes. Child loses target consistently. On circular movement, one eye fails to make 360 degree turn. On diagonal movement, eye stair-steps down or does not move on diagonal line but seems to slip down.

III. Binocularity: Requires use of Tests 1-4, 10-11 on Telebinocular or equivalent vision tester. Most of you will not have access to Telebinocular. You can observe, however, to see if child has an eye that turns out or one that turns in. If either condition exists,, binocularity is probably lacking.

Checking Cortex

I. Walking: Set up chairs on both ends of the room. Ask the child to walk up and down five times, stepping up on the chair as he reaches each end. Tell the child to walk as he usually does. Watch to see if he moves the opposite arm and leg together. Also watch to see which foot he uses for stepping up on chair.

Possible Responses:

_____1. Child does not swing arms but holds them primarily in the balance role (No pattern)

_____2. Child moves arm and leg on the same side of the body (Homolateral)

_____3. Child moves arm and leg on opposite sides of the body as he walks. Arms swing in rhythm with leg movements. (Cross-pattern)

II. Visual Pursuit Tests:

Repeat the 4 tests as described in midbrain section. You stand about 6 feet from child, hold the pencil in your outstretched arm-hand. Tell the child to follow the point on the pencil while you move it. Tell him to move just his eyes and not his head. Watch the eyes closely as he attempts to follow. Performance is judged in the same manner as for midbrain tests.

III. Depth Perception: This is checked by Test 7 of Telebinocular or an equivalent vision tester.

Checking Laterality

(Cerebral Hemispheric Dominance)

I. Handedness:
1. You will already have noted the hand which the child uses for writing.
2. Have him throw the ball to you several times and note which hand he uses.
3. Ask him which hand he uses when picking up fork to eat, glass to drink, brush teeth, cut with scissors.

II. Footedness:
1. You will already have determined foot used when stepping up.
2. Ask him to kick the ball to you several times. Note which foot he uses for kicking. Ask him if he ever uses the other foot and how well he does with it.

III. Eyedness:
There are three kinds of eyedness; sighting, functional and controlling eyedness.

A. 1. Test for Sighting Eye

Have child stand upright about six feet from you. Tell him to stick out his arm and hand and sight down his finger at the pencil you hold. Demonstrate if necessary. Tell him to keep both eyes open. When you think that the child has his eye, finger, and pencil aligned, ask him to close the eye he is not using. The open eye is the sighting eye. (If a child closes both eyes, he is indicating a neurological difficulty)

2. Give the child a tube. Tell him to hold the tube in both hands. Tell him you are going to hide the pencil behind your back and when you bring it out, he is to bring the tube to his eye and look through it at the pencil. Demonstrate if necessary. Repeat the pencil hiding-showing several times. Make sure it is held to far right, far left and in the middle to see if he changes the sighting eye as the pencil position changes.

3. Give him a paper with a small hole in center. (The paper may be prepared by folding it first in half, then folding the halves, and then tearing a small hole direcly at center of folds.)

Tell him to hold the paper in both hands and at stomach height. Tell him you are going to hide the pencil behind your back. Tell him when you bring it out that he is to being the hole in the paper all the way over to his eye and see if he can see the pencil through the hole. Repeat pencil hiding-showing several times. Make sure it is held to far right, far left and in middle to see if he changes sighting eye as the pencil position changes

B. Testing for Functional Eye:

Ask the child to sit down at a desk as he usually does when he writes. Give him pencil and paper and ask him to write this sentence:

My name is _____.

Possible Responses:

_____1. Right-eye, right-hand work together, child will place paper on a diagonal from left to right. Head will be ½ arm's length from paper. Head will tilt slightly to left. Body will be at 15-30 degree angle to table.

_____2. Left-eye, right-hand work together. Child turns paper sideways or it is placed to far right. Head either goes in very close to paper or tilts to right instead of left. Child will sit at 90 degree angle to table. N in name is usually capitalized. Sentence curves upward or downward on unlined paper. Pencil will be gripped very tightly, hand sometimes curves around like some left-handed youngsters write.

_____3. Mixed - Child exhibits some of traits in both 1 & 2 above.

_____4. Left-hand, left-eye work together. Child will place paper on diagonal from right to left. Head will be about ½ arm's length from paper and tilt to right. Body will be at 15-30 degree angle to table.

_____5. Right-eye, left-hand work together. Child places paper on far left or turns it sideways. Head either goes in very close to paper or tilts to left. Writing curves upward or downward on unlined paper.

_____6. Mixed - Child exhibits some of traits in both 4 & 5.

C. Testing for Controlling Eye:

This is usaully determined by whichever is best eye on Tests 5, 6, 12,14 of Telebinocular. It can also be estimated by determining which is the better eye on the Snellen Chart Test.

Appendix E

MUW READING CENTER
COLUMBUS, MS

Neurological Organization Test
Individual Record Sheet

Dr. James I. Califf

Directions: This is an individual record sheet for each child administered the neurological organization test. It follows the organization for testing given in the accompanying, Directions for Administering the Neurological Organization Test.

I. Checking Pons: (Circle appropriate number or word to indicate results):

A. Crawling on Stomach	Inadequate 1 2 3			Satisfactory 4
B. Simultaneous Vision (Test 1 · telebinocular)	Failed		Retest	Satisfactory

II. Checking Midbrain:

A. Crawling on Hands & Knees	Inadequate 1 2 4			Satisfactory 3
B. Visual Pursuit (check appropriate blank)	Pass		Rough	Fail
1. vertical	____		____	____
2. horizontal	____		____	____
3. circular	____		____	____
4. diagonal	____		____	____
C. Binocularity (use telebinocular)	Pass		Fail	Retest
Farpoint:				
2. vertical posture	____		____	____
3. lateral posture	____		____	____
4. fusion	____		____	____
Nearpoint:				
10. lateral posture	____		____	____
11. fusion	____		____	____

III. Checking Cortex:

A. Walking	Inadequate 1 2			Satisfactory 3
B. Visual Pursuit	Pass		Rough	Fail
1. vertical	____		____	____
2. horizontal	____		____	____
3. circular	____		____	____
4. diagonal	____		____	____
C. Depth Perception (telebinocular)	Pass		Fail	Retest

IV. Checking Laterality:

	Right	Left	Mixed
A. Handedness	____	____	____
B. Footedness	____	____	____
C. Eyedness			
1. Sighting Eye			
a. pointing with finger	____	____	____
b. through tube	____	____	____
c. through hole	____	____	____
2. Functional Eye	____	____	____
3. Controlling Eye	____	____	____
a. farpoint	____	____	____
b. nearpoint	____	____	____

Summarizing Results:

1. Mobility was _____

_____

2. Visual pursuit ability was _____

_____

3. Visual difficulties noted were _____

_____

4. Child (is, is not) neurologically organized.

Using Results:

Prescribe exercises if:

1. Inadequate mobility at midbrain and/or cortex was noted.
2. Two or more of visual pursuit tests of midbrain and/or cortical levels noted.
3. Binocularity was lacking (failing fusion test plus failing test 2,3, or 11.)
4. Mixed laterality was noted. (Disregard mixed controlling eye if all other tests are satisfactory.)

M.U.W. Reading Center

Exercises to Improve Neurological Organization

The following is our schedule of exercises, designed by Dr. Carl Delacato, to improve the physiological readiness of your child for reading. The mobility patterns and visual pursuit patterns reinforce each other. Both are necessary parts of the exercise program. If you are not prepared to continue the program for at least a six-month period, read no further.

Daily Schedule

The time spent with the exercises should be approximately 15-20 min. The exercise space should be from 12 to 15 feet long.

First: Cross-pattern crawling on stomach. _____ times.

Second: Cross-pattern crawling on hands and knees. _____ times.

Third: Cross-pattern walking. _____ times.

Fourth: Visual Pursuits - While child holds object in his hand.

Fifth: Visual Pursuits - While someone else holds object to be followed.

Description of Individual Exercises:

1. Cross-pattern crawling on stomach: The child is to lay flat on his stomach. Position the child as follows: (See diagram below)
   a. Right arm stretched out in front.
   b. Right leg stretched out behind.
   c. Left leg is bent with toe of left foot arched to push against floor.
   d. Left arm lies back across the left leg.
   e. Head is turned to the left, facing the left side of the room.

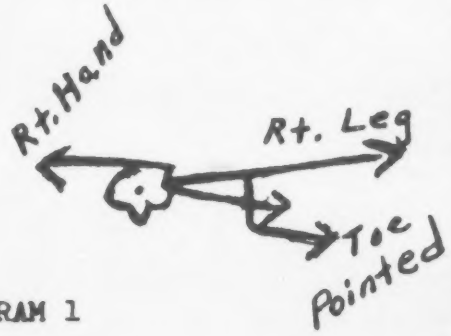


DIAGRAM 1

II. The child then pushes with left toe and foot and pulls with the right hand, straightening out his body as he does. Then he shifts positions as shown in Diagram 2.
   a. Left arm is stretched out front.
   b. Left leg is stretched out behind.
   c. Head is turned toward right wall.
   d. Right leg is bent with toe on right foot arched to push.
   e. Right arm lies back across right leg.

The child continues to shift and move until he has made the required number of trips.

DIAGRAM 2

III. Cross-pattern crawling on hands and knees: The child is to get up on his hands and knees. If right-handed, position him as follows: (If left-handed, reverse position) See Diagram 3.

a. Right hand is forward with fingers together, hands flat and pointed atraight ahead.
b. Right knee is slightly behind the left knee.
c. Right foot extends backwards with top of foot and toes flat on the floor.
d. Left knee is forward.
e. Left hand is placed directly in front of and touching left knee, fingers together and hand pointed straight ahead.
f. Left foot extends backward with tip of foot and toes flat on the floor. (Do not let child's toes curl under)
g. Head is turned slightly so that child can sight on the hand up front.

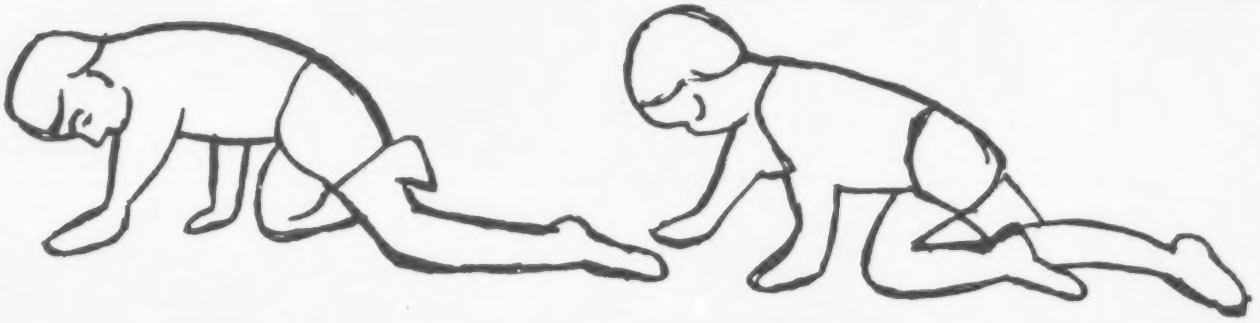


DIAGRAM 4

DIAGRAM 3

After the child is positioned properly, he then switches sides by moving the left hand and right knee at the same time and turning his head to look at the new hand up front. (See Diagram 4). He continues to "switch sides" until he has made the required trips up and down the exercise space.

During the first weeks of the program, the child should be carefully supervised by you. Watch for the following things:

a. Hands are kept flat and pointed straight ahead. Fingers are kept together.
b. The opposite hand and knee are moved each time.
c. The knees are lifted and feet are left in contact with the floor.
d. The child watches the hand up front and turns head in unison with the hand and knee movement.

When child can remember to do all the above things while moving, he has mastered the exercises. Practice at the mastery level produces the most improvement in neurological organization.

IV. Cross-pattern walking: The child is in the standing position for this movement. To begin the exercises, position him as follows if he is right-handed, reverse if he is left-handed. (See Diagram 5.)

a. Right foot is forward, turned slightly outward.
b. Left hand is extended in front of child with index finger pointing straight down and rest of fingers folded under.
c. Child turns head slightly, bends head slightly and sights down finger at big toe of right foot.
d. Left foot remains behind right, pointed straight ahead.
e. Left arm extends straight down and out to the side with index finger extended and other fingers folded under. (Do not let child put hand behind his back.)

The child then shifts sides by moving left foot forward in unison with the right arm and hand and the head turns to sight down the finger at the big toe on the left foot. (See Diagram 6)

DIAGRAM 6

DIAGRAM 5

The child continues to "shift sides" until he has moved the required number of times up and down the exercise space. The speed of movement may be varied but a steady rhythm should be maintained. It is most important that you carefully supervise the first weeks of the exercise program. Make sure he does the following things:

a. Legs must not cross but move forward in parallel lines.
b. Right foot turns alightly outward, left foot goes straight ahead. (Reverse is true for left-handed child.)
c. Make certain that child rotates his head, neck and eyes toward forward hand with each step.

V. Visual Pursuit While Child Holds Object: This set of exercises is the follow-through for the crawling on the hands and knees mobility exercise. Position the child as follows:

a. Child stands upright away from wall or supporting object.
b. Heels should touch with feet turned slightly outward.
c. Child holds object for pursuit firmly enclosed in his writing hand with arm fully outstretched.
d. You cup your hand over his.
e. Tell him to watch a point on the object while you move his hand.
f. Tell him to move just his eyes and not his head.
g. Move his hand through each of the following planes:

Vertical: Start with the object at nose height and directly in front of the nose. Move object as far upward as eyes will go. Move the object back to the nose and stop. Move object as far downward as his eyes will travel and then back up to the nose and stop. (See Diagram 7)

Repeat movement 5 times.

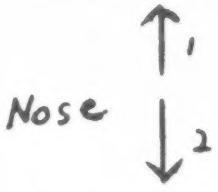


DIAGRAM 7

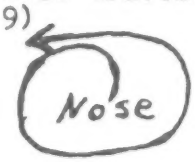
Horizontal: Start with object directly in front of nose. Move object as far to the right as eyes will move sideways, coming back on straight line to nose and stop. Move object as far to the left as the eyes will move sideways, coming back to nose and stop. (See Diagram 8)

Repeat movement 5 times. If child is left handed, make sure he holds the object in left hand and moves to left first in exercises 2, 3, 4.

DIAGRAM 8

Circular: Begin at nose. Move object-hand up and over to the right, continuing the movements until you have made a circle five times. Make the circle go as far up and as far down as the eyes will travel. You do not have to stop once you have begun. (See Diagram 9)

DIAGRAM 9



Diagonal: Begin at the nose. Move object-hand to right in straight line as in horizontal movement. Then bring object-hand on a diagonal across chest to left pocket. Then move object-hand in a straight line across the stomach to the right pocket. Then move object-hand on a diagonal across chest to left shoulder. Continue movements five times. (See Diagram 10)

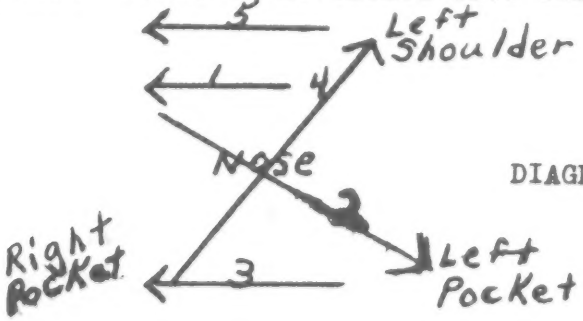


DIAGRAM 10

VI. Visual Pursuit While You Hold the Object to be Pursued:

These exercises are the follow-through on cross-pattern walking.

The child stands upright, head perpendicular to shoulders, heels together with toes turned outward, and arms down by his side.

You stand during the first week at a distance of 8 feet with object enclosed in your fist and arm stretched outward.

Tell the child to follow some point on the object with his eyes and not his head.

As explained in 4, repeat movements through the four planes. Each movement is done five times.

Eadh week move in a little closer until you have reached a point of 2 feet from the nose. Do Not move closer than 2 feet.

Things to watch for in Visual Pursuit Exercises:

a. Make sure his head does not tilt sideways but is held perpendicular to the shoulders.
b. On the vertical pursuits, the object should remain in the middle of the face. Displacement to the right or left will cause improper movement of that eye.
c. Move object at moderate speed. If child loses object, stop and let him catch up with it. Do not let him lag behind or get ahead of the object.
d. If he has trouble keeping his head still, let him use the wall for support for a week, then move him away from the wall.

Additional Suggestions:

1. Try to have a consistent time for doing the exercises. If done right before bedtime, the exercises may wake the child up.
2. No child is too old to be read to. You might have the child select a book he would like for you to read to him while he is doing his mobliity patterns.
3. For the first two months, the exercises should be done seven days a week. After that time, the week-end exercises can be suspended when other activities interfer. In the summer, two sessions a day will help speed up the process.
4. Keep stressing to the child the necessity for doing the exercises well. Practice at the mastery level achieves the results we are seeking.
5. Teach the child to correct his own performance by asking him what he is doing wrong if he is making a mistake. Never spank the child for not wanting to do the exercises.